Judge Guenther Memorial Center
1709 W. College Street, Suite 104
Bozeman, MT 59715
(406) 582-3148 or 582-3145
www.gallatin.mt.gov/GLWQD

BACTERIAL CONTAMINATION AND YOUR WELL

What are Bacteria?

Bacteria are among the simplest, smallest, and most abundant organisms on earth. These microscopic, single-celled organisms can be found in a wide range of environmental conditions.

Most bacteria are harmless, and are directly beneficial or even essential to animal and plant life. Bacteria are the beginning of the food chain. Their role as decomposers of organic matter is essential to plants and animals. They can be found on human skin surfaces and in our saliva. Bacteria are an essential part of the digestive process of animals and insects. Certain types of bacteria can be cultured and put to direct beneficial use in medicine and industry. In fact, the main principle behind septic systems and most wastewater treatment facilities is the use of bacteria to naturally breakdown waste components.

Some bacteria are harmful. These pathogenic microbes can infect humans, animals, and plants causing illness and disease.

What are coliform bacteria?

Coliform bacteria are a group of closely related and generally harmless bacteria. As a common inhabitant of the intestinal tract of humans and warm-blooded animals (e.g. pets, livestock, wildlife, etc.), coliform bacteria are essential to the function of the digestive system. They can also be found in soil, untreated water (streams, ponds, rivers, etc.), and on the skin.

Can coliform bacteria contaminate drinking water?

Two types of coliform bacteria are tested for when analyzing a water supply for potential contamination; ***total coliform*** and ***fecal coliform***.

The presence of **total coliform** bacteria in drinking water indicates that other disease-causing organisms *may* also be present in the water. These include parasites like *Giardia* and *Cryptosporidium*, bacteria such as *Cholera* and viruses like Hepatitis. Since these pathogenic organisms can also be found in fecal material, coliform bacteria are used as an indicator for assessing water quality.

Fecal coliform bacteria are a subgroup of coliform bacteria. *Escherichia coli (E. coli)* is one species of fecal coliform bacteria. Because these bacteria inhabit the digestive system of humans and other warm-blooded animals, they are present in large numbers in fecal material. The presence of *E. coli* in a water supply is a direct indicator of fecal contamination.

Can coliform bacteria get into a well?

A properly constructed well that is lined and grouted (sealed) usually obtains its water from a depth at which bacteria are no longer present.

However, there are many ways coliform bacteria can get into a well. They can migrate into ground water when there is insufficient filtration or travel time between the land surface and the ground water. Over time, old well casings may rust through leaving holes near the ground surface where surface water can seep into the well water. A well casing can become cracked due to impact damage, ground settling around the well, or earthquakes providing a conduit for contamination.

If a well has not been properly sealed, bacteria from upper soil layers may migrate down into the well.

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Bacteria can enter ground water via transport pathways derived either from point or non-point sources, or a combination of the two.
Point sources are readily identifiable and typically discharge from a local source area. Some examples of potential point sources include improper surface well seals and public sanitary sewer overflows (due to power outages or flooding).

Non-point sources originate from a more widespread area and can be more difficult to identify. These can include agricultural, residential, and urban stormwater runoff; livestock excrement from barnyards, feedlots, rangelands, and uncontrolled manure storage areas; failed or improperly maintained septic systems; and land application of manure or sewage sludge.

Testing your water for coliform bacteria

It is a good idea to have your drinking well water tested for coliform bacteria at least once a year. Testing can be done for fecal coliform specifically or for total coliform bacteria--which includes all coliform bacteria strains and may indicate fecal contamination.

Types of coliform bacteria tests

There are several types of tests to determine if your drinking water is contaminated with coliform bacteria.

1. Total Coliform Count or "Presence-Absence" Test

The most commonly used water quality test for coliform bacteria is the "presence-absence" test. This is a qualitative test rather than quantitative and will detect any coliforms (fecal and non-fecal) present in the water. The growth of total coliform bacteria would indicate the possibility of fecal contamination of the water. Because the EPA drinking water standard concentration for coliform bacteria is **zero**, this makes the presence-absence test appropriate for routine water quality testing.

2. Fecal Coliform Count Test

The fecal coliform count tests specifically for coliform bacteria associated with the intestinal tracts of humans and warm-blooded animals; the most common of which is *E. coli*. Tests can be done to look specifically for *E. coli* bacteria, but these are more expensive than fecal coliform tests and, generally, are not much more useful since there are many strains of *E. coli* which do not pose a human health threat. The EPA drinking water standard concentration for fecal coliform bacteria is **zero**. The fecal coliform count test is an important indicator of the health risk associated with the water sampled because the presence of fecal coliform bacteria indicates that the water has been contaminated with the fecal material of man or other warm-blooded animals.

How coliform bacteria tests are done

The most common procedure used for coliform bacteria tests is the membrane filter (MF) procedure. In this process, a 100 milliliter (ml) sample of drinking water is passed through a sterile membrane filter. The bacteria attach to the filter while the water passes on through. The filter is then placed on a culture growth medium that provides nourishment for any bacteria that may be attached to the filter. The growth medium that the membrane filter is placed on is highly specific for coliform bacteria. After a standard incubation time, the coliform colonies, if any, that have grown on the culture medium are counted. Results are reported as, "number of colonies/100 ml".

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How to collect a water sample for coliform bacteria analysis

The individual well user can collect water samples for coliform bacteria analysis without difficulty. Keep in mind that it is extremely important to follow proper sampling procedures in order to get the best sample possible from your well. Improper sample handling or failure to follow the simple procedures listed below may result in a false-positive test result.

Local laboratories for water testing

Well test kits are available, free of charge, from the Gallatin Local Water Quality District for several laboratories in the area. Stop by to pick-up at: 1709 W. College St., Suite 104, Judge Guenther Memorial Center, Bozeman.

Step-by-Step Sampling Procedure

Important Points to Remember:

- The water sample should only be collected in a sterile sample bottle provided by the GLWQD, Environmental Health or the testing laboratory. **NOTE:** A clean bottle or jar from your home IS NOT STERILE and does not contain the preservative necessary for proper sample processing.
- The water sample should be delivered to the laboratory within 30 hours from sampling time.
- Keep the sample refrigerated, not frozen, prior to delivery to the lab.
- Many labs do not accept water samples after Thursday. Consult the lab you plan to use before collecting the sample.
- Keep the sample bottle tightly capped until you collect the sample!

Materials You Will Need:

- ❑ Small quantity of household liquid bleach.
- ❑ Sterile bacteria sample collection bottle for a testing lab.

A. Select the sampling point:

1. If you have a water softener or filtration system installed in your home, you will need to collect the sample at a faucet between the well and the treatment unit. If you do not have a household treatment system, take the sample from the kitchen sink. Other faucets may be used for sampling; however, the kitchen faucet is used most often for drinking water in the home.
2. Avoid sampling from a mixing type faucet (single control for adjusting the water temperature). Sinks with separate hot and cold water controls are the best.

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B. Collecting the sample:

1. If the faucet has an aerator screen, remove the screen or use a different faucet if the screen cannot be removed.
2. Clean the exterior of the faucet and the interior threads of the faucet mouth for 1 minute with a chlorine bleach solution:

   ½ teaspoon bleach in 8 ounces of water
3. Run the hot water for 5 minutes; then the cold water for at least 2 minutes.
4. Adjust the flow of the water to a stream about the width of a pencil.
5. Open the sample bottle being careful **not to touch** the inside of the container or lid. If you do, discard the container and use another sterile sample bottle.
6. When you open the bottle you will observe either a small amount of powder or a tablet in the bottle. This is a preservative added by the lab **do not rinse the bottle**.
7. Tip the bottle at a 45 degree angle and fill to the "fill line" (100 ml line) or to within ½ inch of the top of the bottle. Be careful not to allow the water to splash back out of the container.
8. Immediately cap the container tightly. Do not touch the inside of the cap.
9. Completely fill out the label on the bottle and the sampling form. Make sure you note the date and time sampled and the location or sampling point.
10. Deliver the sample to the laboratory you have selected for analysis. If mailing your sample, **do not mail on a Friday** as samples often are not delivered until Monday which exceeds the 30-hour time frame.

If you have questions prior to sampling, call the lab that will be analyzing your sample or call the Gallatin Local Water Quality District at 582-3148.